Canadian Centre for Occupational Health and Safety

Centre canadien d'hygiène et de sécurité au travail

PASSIVE SMOKING

Health Effects and Workplace Resolutions

P89 - 2E

89-02861/

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February 1989

CCOHS/CCHST

PASSIVE SMOKING--HEALTH EFFECTS AND WORKPLACE RESOLUTIONS

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CCOHS NUMBER P89-2E
ISBN 0-660-13113-7
DSS CATALOGUE NUMBER CC273-2/89-2E

Cette publication est offerte en français sous le titre: Le tabagisme passif--Effets sur la santé et solutions en milieu de travail (P89-2F).

Published 1989

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1. INTRODUCTION

Passive smoking refers to the exposure of people to tobacco smoke though they themselves are not smoking at the time. It is also called involuntary smoking. The tobacco smoke inhaled by passive smokers is usually called environmental tobacco smoke (ETS). Concern about its health effects is relatively recent and parallels evidence of health effects in nonsmokers. The available information is summarized here as:

- tobacco smoke--composition and exposure
- signs, symptoms and possible consequences of exposure
- ventilation standards and requirements for tobacco smoke
- policies and programs in the workplace

2. TOBACCO SMOKE--COMPOSITION AND EXPOSURE

Tobacco smoke consists of solid particles and gases. More than 3800 different chemicals have been identified in tobacco smoke.[1] At least 50 of these are known to cause cancer in animals, humans, or both.

The solid particles make up about 10 percent of tobacco smoke and include "tar" and nicotine.

The gases or vapours make up about 90 percent of tobacco smoke. The major gas present is carbon monoxide. Others include formaldehyde, acrolein, ammonia, nitrogen oxides, pyridine, hydrogen cyanide, vinyl chloride, N-nitrosodimethylamine, and acrylonitrile.[1,2,3]

Mainstream Smoke and Sidestream Smoke

Environmental tobacco smoke is composed of exhaled mainstream smoke and sidestream smoke. Mainstream smoke is first drawn through the cigarette, cigar or pipe into the smoker's lungs, and then exhaled. Sidestream smoke is emitted from the burning end of a cigarette, cigar or pipe and enters directly into the environment. Sidestream smoke contains higher concentrations of several chemicals than the smoke inhaled by the smoker (for example carcinogens such as 2-naphthylamine, N-nitrosodimethylamine, and 4-aminobiphenyl, and carbon monoxide).[1,2,3]

Both active and passive smokers may be similarly exposed to sidestream smoke and exhaled mainstream smoke. Nearly 85 percent of smoke in a room results from sidestream smoke.[4]

Passive Exposure to Tobacco Smoke

It has been estimated that nonsmokers in a room full of tobacco smoke probably inhale as much N-nitrosodimethylamine in one hour as a smoker smoking 15 non-filter or 35 filter-tipped cigarettes.[5] It is hard to measure the exposure of a passive smoker to environmental tobacco smoke. The exposure varies according to the type and number of cigarettes or other tobacco products burned, the number of smokers present, the rate and manner of smoking, the room volume, the room ventilation rate, and the percentage of fresh makeup air supplied.

Some studies have attempted to compare exposures of passive and active smokers. For example, it is thought that someone exposed to environmental tobacco smoke will breathe in the same amount of carbon monoxide in one or two hours as if they actively smoke one cigarette. Similarly, it would take a passive smoker eleven hours to breathe in the same number of smoke particles, seven hours for the same amount of acrolein, and fifty hours for the same amount of nicotine and hydrogen cyanide. Such estimates depend greatly on the particular tobacco smoke contaminant chosen for the active/passive smoking comparisons.[4]

Exposure to environmental tobacco smoke can be estimated in terms of "cigarette equivalents." Cigarette equivalents can be measured by determining nicotine and cotinine in urine or by measuring carbon monoxide carboxyhemoglobin levels in blood. One study which measured increased carboxyhemoglobin levels in passive smokers concluded that an eight-hour exposure to environmental tobacco smoke is the same as smoking about five cigarettes.[6]

Nonsmokers absorb nicotine and other tobacco products from environmental tobacco smoke. Another study compared nicotine concentrations in the urine and saliva of 82 smokers and 56 nonsmokers after a morning at work. All nonsmokers had amounts of nicotine in both saliva and urine close to those found in light smokers. "Light" smokers had smoked up to three cigarettes in the three to four hours before the measurements.[7]

Most of the nicotine absorbed by smokers is broken down rapidly, with cotinine as the major by-product. Cotinine in the blood and urine is probably a better indicator of tobacco smoke exposure than nicotine. It stays in the blood longer (about 30 hours) and reaches higher concentrations in blood and urine, making testing easier.[4] Studies indicate the presence of nicotine and cotinine in the blood, urine, and saliva of nonsmokers passively exposed to tobacco smoke.

Comparisons of various biological monitoring studies on active and passive smokers suggest that passive exposure over an eight-hour day is comparable to light active smoking.[4]

3. SIGNS, SYMPTOMS AND POSSIBLE CONSEQUENCES OF EXPOSURE

The health effects believed to be associated with exposure to environmental tobacco smoke include:

- irritant effects
- effects on persons with pre-existing diseases
- heart disease
- chronic respiratory disease
- lung cancer
- cancers other than lung cancer

Irritant Effects

Many of the substances in cigarette smoke are acutely irritating to the eyes, throat and respiratory mucous membranes. A high proportion of nonsmokers report eye irritation, headache, nasal discomfort, cough, sore throat, or sneezing when exposed to cigarette smoke.[8] Eye irritation seems the main symptom during passive exposure to cigarette smoke.[1,2]

Environmental tobacco smoke in offices is said to affect the working efficiency of more than half of the nonsmokers. Some workers studied reported that they were forced to move away from their workstations to avoid breathing smoke. Others reported difficulty in concentrating due to passive smoking. Nearly 25 percent of the nonsmokers expressed feelings of frustration and hostility towards smokers and management.[8]

Effects on Persons with Pre-Existing Diseases

Nonsmokers with heart disease (angina pectoris) exposed to environmental tobacco smoke in ventilated and unventilated rooms had increased heart rates, elevated blood pressures and increased carbon monoxide in the blood.[9]

Environmental tobacco smoke aggravates allergy symptoms.[10] It is generally more irritating to the respiratory tract of asthmatics and it can aggravate some asthmatic symptoms such as wheezing.

Heart Disease

It is known that active smoking is a cause of heart diseases. But only a few studies have examined passive smoking as a risk factor for these diseases. A Japanese study found a small but statistically significant increased risk of heart disease for nonsmoking women married to smokers.[11] Although other studies have noted an excess of heart disease in nonsmokers exposed to passive smoke, no firm conclusions about the results can be made.[1,2,12]

Chronic Respiratory Effects

Lung function tests have been used to investigate the effects of passive smoking. One study evaluated the effect of long-term (greater than 20 years) workplace exposure to tobacco smoke on pulmonary function in healthy, middle-aged nonsmoking workers (professional, managerial, technical and blue collar).[13] The results showed declines in lung air flow rates and possible damage to small airways of the lungs. Compared to those not exposed at home or at work, passive smokers of both sexes experienced declines in lung air flow rates. The values found did not differ significantly from those measured in non-inhaling or light smokers. The study concluded that chronic exposure to cigarette smoke in the work environment reduces small airways function to the same extent as smoking one to ten cigarettes per day.

Women living with heavy smokers appear to have the same reduction in lung air flow rates as light smokers, and after fifteen years' exposure in the home may experience permanently reduced lung function.[14] A certain duration of exposure to environmental tobacco smoke is necessary before effects on the pulmonary function are observed.[4]

There seems to be evidence for a reduction in lung function from exposure to passive smoke in the home and at work, but these findings need to be corroborated by further studies.

Lung Cancer

Active smoking is known to cause cancers of the mouth and throat, esophagus, pancreas, and urinary tract as well as lung cancer.[2] It is not known how much exposure to tobacco smoke is needed to cause any of these cancers, so we do not know for certain whether environmental tobacco smoke can cause cancer.

Exposure of humans to environmental tobacco smoke results in an increase of the urinary excretion of chemicals which can damage genetic material (mutagens) as measured by a laboratory test which uses bacteria (the Ames test).[4,12] Damage to genetic material is known to be one of the steps which can lead to cancer.

Since 1980, eighteen epidemiological studies have investigated the possible relation between lung cancer and exposure to passive smoking. These studies classify subjects on the basis of whether the nonsmoker lived with a smoker. Based on thirteen of these studies, the chief observations are as follows.

The evidence as a whole indicates that exposure to environmental tobacco smoke increases the incidence of lung cancer in nonsmokers. Among studies of various populations in Europe, Asia and North America, the risk of lung cancer for nonsmoking spouses of smokers was 1.34 times that for nonsmoking spouses of nonsmokers. For all women, the risk was 1.32, while for men it was 1.62.[1]

Seventh Day Adventists, who do not smoke as a religious principle, have been used for comparative studies. Such studies conclude that an estimated 4700 lung cancer deaths a year in the United States can be attributed to passive smoking.[15] This is about 5 percent of the total annual lung cancer deaths and about 30 percent of lung cancer deaths in smokers in 1982.[15] In Canada, 470 lung cancer deaths per year could be attributed to environmental tobacco smoke.

No single study conclusively defines the extent of risk for exposure to environmental tobacco smoke. But all studies point to an association between lung cancer and passive smoking.[1,2,15] Such an association is plausible given the proven link between lung cancer and active smoking, the known presence of several carcinogens in environmental tobacco smoke, and the general acceptance that the risk of lung cancer is directly related to the amount of tobacco smoke inhaled.[1,4]

Cancers Other than Lung Cancer

A few recent studies suggest that exposure to environmental tobacco smoke may increase the risk of cancer at sites other than the lung. Associations were found between passive smoking and smoking-related cancers such as cervical cancer and nasal sinus cancer[13] and cancers not related to smoking such as brain cancer, breast cancer, cancer of endocrine glands, leukemia, and lymphoma.[1] The results of these studies have been inconsistent, and there is only very limited evidence of any increased risk for cancers other than lung cancer.[1,2,12]

4. WORKPLACE RESOLUTIONS

Ventilation Standards and Requirements for Tobacco Smoke

Some people propose increased ventilation as one of the ways to control the concentrations of tobacco smoke contaminants and resolve the problems created by smoking in the workplace. The quality of the air in a building depends on the design and operation of the building's environmental control system. Control systems are designed to maximize human comfort. But cost and energy constraints are imposed so the goal of maximal comfort is often compromised. Control systems usually operate within codes and standards that have been developed to protect the health and welfare of occupants. One such set of standards is produced by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

Minimum required ventilation rates are usually set to limit the carbon dioxide concentration. Ventilation rates for smoking can be based on various factors, such as odour noticed by visitors to a room, irritation experienced by nonsmoking occupants, haze (smokiness), or concentrations of smoke contaminants. Tobacco smoke odour is very difficult to control by ventilation and requires high ventilation rates. Also, standard filtration systems in buildings do not remove carbon monoxide or any of the other gases present in tobacco smoke.

ASHRAE Standard 62-1981R recommends a minimum ventilation rate of 17.5 L/s (litres per second) or 15 cfm (cubic feet per minute) of fresh outside air per person. (This corresponds to a level of 1000 ppm CO_2.)[16]

The recommended ventilation rate for office spaces is 10 L/s or 20 cfm, and 17.5 L/s or 35 cfm for other spaces where smoking is higher. But for spaces occupied by a reasonably large number of smokers and nonsmokers, where approximately 10 percent of the occupants will be smoking at any given time, the ventilation rate per person would need to be 17.5 to 26.5 L/s (35 to 53 cfm) to reduce odours to an acceptable level.[17]

The ASHRAE standard appears to be adequate to meet the ambient air quality standard for carbon monoxide, but is inadequate to cope with total suspended smoke particulates.[18]

Many researchers have concluded that attempts to overcome tobacco smoking contamination by ventilation are futile, since they require ventilation rates far in excess of what is economical, and are contrary to the current trend towards energy conservation in buildings.[19] There is a growing consensus that, while some adjustments to workplace ventilation systems may reduce tobacco smoke pollution, the effectiveness of this approach is limited. It is considered that a more practical approach is to control the tobacco smoke contamination at its source by introducing policies and programs for employees who smoke.

Policies and Programs

Workplace smoking policies and programs are necessary because attitudes toward smoking have changed and evidence is mounting that passive smoking is harmful to the nonsmoker. People in the United States and Canada have brought legal action against organizations and companies that have refused to provide a smoke-free environment in which to work.[20] In the United States, some nonsmokers have won their cases.[21] In Canada, office workers have filed grievances against their employers because of the presence of environmental tobacco smoke in their offices, have demanded smoke-free workplaces, and have won. But other employees who have tried to use provisions of Canadian occupational health and safety laws to protect them from environmental tobacco smoke have been unsuccessful.

Workplace smoking results in higher expenses for employers. It has been estimated that on the average, each smoking employee costs the employer more than $4600 a year. Smoking on the job increases absenteeism, property damage, and health and fire insurance costs. It can also lower the morale and productivity of some nonsmoking employees.[21,22]

These factors have led many employers to institute smoking controls in the workplace. Some have introduced policies that restrict smoking in the workplace, or limit certain types of jobs to nonsmoking employees. Others offer programs designed to encourage and assist employees to give up smoking.[21]

Smoking Restriction

Smoking restriction policies range from minor measures, such as dividing common work areas into smoking and nonsmoking sections, to total bans.[23]

Under a total ban, smoking is prohibited in all of the organization's or company's premises. A workable compromise to a complete ban is to establish a separately ventilated smoking lounge for use by smokers. This compromise gives smokers a place to smoke, and it guarantees a smoke-free environment for nonsmokers, but it does entail extra costs. The smoking area must be vented directly to the outside, and smokers may leave their offices and workstations to go to the smoking lounges to have a cigarette at times other than a designated break, possibly reducing productivity.

Other companies have instituted smoking policies in which smoking is banned in some parts of the building. The ban may include all workstations, and all "common" areas such as lobbies, halls, and elevators. In certain designated areas, such as in private offices and shared offices, smoking may be permitted by mutual consent.

Some companies have attempted to deal with the smoking problem by segregating smokers and nonsmokers. This requires smoking and nonsmoking workstations, office areas, lunch areas, and lounges. Although this approach is intended to satisfy both smokers and nonsmokers, it is not entirely effective. Tobacco smoke is not eliminated under this system, since it is almost impossible to remove tobacco smoke from buildings by ventilation or other means such as electrostatic filters. Therefore some tobacco smoke components will drift over from the smoking to the nonsmoking areas and nonsmokers will be exposed to the tobacco smoke. In addition, neither smokers nor nonsmokers are satisfied by this segregated arrangement. Nonsmokers continue to object to drifting tobacco smoke and smokers dislike being segregated from their colleagues.

For a workplace to have effective smoking controls, the strategies used should be fully supported by the employer or top management, and by a majority of employees.

Smoking Cessation

To help those smoking employees who want to stop smoking, a number of companies sponsor or subsidize smoking cessation programs. Also, there may be financial incentives to help employees quit smoking. Sometimes complete health promotion programs have been implemented including fitness and nutritional counselling, exercise classes, and organized sports activities.[21,23]

Legal Measures

At present, there are few legal statutes to protect the nonsmoker from environmental tobacco smoke. But public pressure is having an effect. Recent federal legislation restricts smoking in federal workplaces and on public transportation under federal jurisdiction. Some provincial governments are contemplating legislation to permit municipalities to restrict

smoking in workplaces under their jurisdiction. In 1988, Ontario introduced a bill which would prohibit smoking in all areas of a workplace except designated smoking areas, public areas, and areas used for lodging and private dwelling. A few municipalities, such as Toronto and Vancouver, have passed bylaws to restrict workplace smoking.

Policy and Program Implementation

How should a smoking policy be instituted? Ideally, employees should be included in the planning. Open discussions should take place on the kinds of policies that might work and how they should be enforced. As a rule, a strong policy needs to have the backing of all the groups which are covered by it. It is, therefore, important that adequate discussion and participation between management and the employees take place.

The transition to a smoke-free workplace can be implemented through specific steps.[23] The employees are kept informed of each step and employee input is requested.

If an organization has committed itself to a smoke-free work environment, it should be prepared to enforce its smoking ban unconditionally. For example, allowing supervisory personnel to smoke because they may work in enclosed cubicles promotes resentment among smokers who aren't allowed to smoke in open areas.

The view that employers have the legal right to prohibit smoking on company premises seems to be gaining acceptance in the legal community and in the courts. In many respects, tobacco smoke is like any other workplace air contaminant. It can be reduced or eliminated by controlling emission at the source and by instituting policies and procedures to ensure the safety of all employees.

The key to a successful smoking program or policy is to ensure, through discussion, that it has support from the majority of staff and management.

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